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EXOBIOLOGICAL STUDIES OF INTERPLANETARY SPACE AND UPPER ATMOSPHERIC LAYERS

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ABSTRACT

The author suggests a means of determining whether living organisms exist in interplanetary space or in the upper layers of the atmosphere. An apparatus, called a "biosyllectus" (from the Greek bios--life and syllegein--collect), for collecting such microorganisms is described.

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A new branch of biology, exobiology, has been developed in the last decade. This new discipline of biology depends on the advances in physics, chemistry, mathematics and technology. It is concerned with the investigation of the problem of whether living organisms can exist on other planets, of the problem of the conditions necessary for this existence, and with the problem of whether generally such spores can exist in interplanetary space. The advances of astronautics have given exobiology the chance today to go beyond the stage of theories and hypotheses, which were primarily based on the observations of astronomy and astrophysics; however, this has not as yet been done in a systematic manner. I do not know whether a pertinent report from the Goddard Space Flight Center of March 4, 1965 of the American space agency about a future project to launch an apparatus for investigating the question whether living organisms exist in the upper layers of the atmosphere and in interplanetary space has, in the meantime, become reality. The principle on which this method is based is luciferin and the enzyme luciferase, which can

*The numbers in the margin indicate the pagination in the original foreign text.

be found in the luminescent organs of some life forms. They give a luminescence reaction in the presence of even minute traces of adenosine triphosphate, a substance which is found in every plant or animal cell.

I should like to suggest the construction of the following apparatus for the purpose of investigating the question of whether spores of life forms do exist in the upper layers of the atmosphere and in interplanetary space. 12

With this apparatus we avoid all dangers of infection in the space to be examined as well as when the apparatus returns to the surface of the Earth to the moment of opening it in the laboratory for further investigations. I should like to call this apparatus "biosyllectus" from the Greek bios--life and syllegein--collecting.

Description

The biosyllectus is surrounded by the metallic surface of two hollow hemispheres B and b (fig. 1). Surface b of hemisphere A, turned at an angle of 180°, is rotated so that it lies underneath the surface of b' of the other hemisphere B; in this manner the space of the upper hemisphere A, filled with a spongy plastic material (fig. 2) is exposed. This material is the essential "biosyllectus" on which the space spores are collected. The spongy material is fastened to a metallic diaphragm (partitioning wall), which divides the sphere into two hemispheres, A and B. The instruments for opening and closing the upper hemisphere filled with the spongy plastic material are in the lower hemisphere B. This also contains the instruments for recording the atmospheric pressure, heat, etc. The metallic diaphragm has a crescent opening for surface b of the hemisphere, which moves at the opening and closing of the upper hemisphere A. The lower rim of the metallic surface b ends in two half rings

(f and f') in order to seal the upper hemisphere A hermetically. Half-ring f presses from above on the diaphragm, the other half-ring f' presses from below. Since we must have a complete hermetic seal, we have inserted between the half-rings f and f' on the one hand and the diaphragm on the other hand two half-rings C and C', made of foam rubber. 13

Before launching, the sphere is sterilized and covered with a layer of organic material, mixed with a substance giving off oxygen (for example, saltpeter).

When the apparatus has reached the point where it is supposed to collect space spores, this organic material ignites before the spongy material in the upper hemisphere is exposed (ignition is caused by electrical sparks automatically instigated by the instruments contained in the lower hemisphere), and in this manner all spores carried from the surface of the Earth or from the lower layers of the atmosphere are destroyed.

On return to the laboratory, where the apparatus will be opened, its surface will be sterilized, a vent at the axis will be opened and sterilized air will be introduced into the vacuum of the intervening spaces of the spongy material in order to avoid the sudden inflow of air and the infection of the spongy material.

According to my concept the research laboratory should consist of three connecting rooms. The first room should be used to take a shower and to change clothing, every-day clothing being exchanged for sterilized clothing. In the second room another sterilized suit if put on over the first one, and finally in the third room, where the apparatus will be opened, there are a series of cabinets along the walls containing various nutrients, temperature conditioners, various radiations and air pressures, etc. For the cultivation of

the autotrophic and heterotrophic organisms as well as the examination of the 14 viruses and the hypothetical extraterrestrial organisms, there will be a group of biologists to establish a program.